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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,430	11/13/2003	Joseph D. Rigney	041A.0005.U1(US)	1772

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EXAMINER	
TUROCY, DAVID P	

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 11/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/714,430	RIGNEY ET AL.
	Examiner	Art Unit
	David Turocy	1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 October 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's arguments and amendments filed 10/12/2004 have been fully considered and reviewed by the examiner, but they are not persuasive. The examiner acknowledges amendments of claims 1, 19, and 25. Claims 1-25 are pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-6 and 9-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Draghi et al. (5,972,424) in view of Arnold (6,049,978) and Schaeffer et al. (5,851,409).

Draghi et al. teach that it is known in the art to repair a turbine engine-run component having a damaged thermal barrier coating system thereon, said system comprising a coating on a base metal substrate consisting of a bond coat and a top ceramic thermal barrier coating (TBC), as required by the independent claims (columns 1-2). The thermal barrier coating inherently has a "thickness t". Draghi teaches that known repair operations remove the ceramic thermal barrier coating along with the metallic bond coat, and also a portion of the base metal substrate under the metallic bond coat, thinning the wall of the component to some degree (col. 1, lines 57-60). Draghi teaches that the thinned wall thickness is measured. Since the original thickness was known, the amount of base metal substrate removed can be denoted by Δt, i.e., a change in thickness, as required by Applicant. After removal of the damaged coatings, Draghi teaches that the turbine blade enters the repair cycle, which may include various operations but naturally includes reapplication of both layers of the thermal barrier coating, the metallic bond coat and ceramic barrier coating layers (Column 2, lines 3-7, lines 12-15). However, Draghi only discloses that the various operations may be included and therefore such operations may not be necessary. Therefore the repair operation may be limited to, providing a turbine engine-run component with thermal barrier coating, removing of coating plus a portion of the metal base, and subsequent

reapplication of the metal bond coating and ceramic coating. The prior art method taught by Draghi requires applying a bond coat and build-up of thermal barrier coating material such that the total thickness of the repaired part (substrate plus coating layers) is restored to the pre-damaged conditions, as required by the claim. To do so, the amount of base substrate material removed must be "made up" by some additional amount of re-applied bond coat *and/or* TBC. It would have been obvious to one of ordinary skill in the art to re-apply the bond coat and then, based on the thickness still required to return the part to pre-damaged conditions, build up the TBC to the desired dimensions, as outlined by Draghi's teachings. Such a process meets the limitations of reapplying the TBC in an amount of "$t+\Delta t-\Delta x$" because, to restore to original dimensions, the thermal barrier coating must be applied in a thickness of "original TBC thickness plus any thickness of base substrate lost minus any difference in the original versus bond coat thickness", as required by Applicant's equation.

Examiner additionally cites Arnold merely as a second teaching that during repair of gas turbine engine foils, the repair engineer must determine the difference between pre-repaired dimensions of the part and the desired post-repair dimensions, from which he or she determines the necessary build-up thickness of repair coating material to be applied to obtain the desired post-repair dimensions. The necessary build-up thickness takes into account any additional thickness of the post-repaired part due to the protective coating, such as Δx from Applicant's equation. Any equation Arnold uses to

determine how much build-up thickness to use will require the same "t+Δt-Δx" analysis required by Applicant and inherent in Draghi's teachings.

While Draghi teaches the basic steps of a known prior art repair method, he does not detail the types of materials used for repair. It is Examiner's position that these materials are well-known in the turbine repair art and that it would have been obvious for an ordinary artisan to look to the repair art for suitable formulations.
Examiner cites Schaeffer for such formulations.
Schaeffer teaches a method of repairing the TBC system (bond coat plus TBC) of turbine engine parts by removing the TBC system and replacing the system with a new one (abstract; col. 2). When the substrate of the part is made from a nickel superalloy (which is required by Applicant in later claims), Schaeffer teaches the replacement bond coat to be nickel-aluminide beta phase (NiAl), as required by Applicant in claim 1.
Since Draghi teaches repair of TBC systems by removal and replacement and Schaeffer teaches that the bond coating component of the TBC be beta NiAl when the substrate is nickel-based, which is a well-known turbine engine part substrate, Schaeffer would have reasonably suggested the use of beta phase NiAl as the bond coat replacement material in Draghi. It would have been obvious to one of ordinary skill in the art to use the teachings of Schaeffer in the method of Draghi with the expectation of successful results when nickel-based superalloy substrates are repaired.

Claim 2 is addressed above.

Regarding claim 3, it is Examiner's position that weight is interchangeable for thickness in determining amounts of coating applied.

Regarding claims 4 and 14, the thicknesses of the layers would be cause-effective variables, selected by an ordinary artisan depending on the required use of the turbine part or its "class".
It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

Regarding claims 5-6, 9-10, and 12, Draghi teaches diffusion aluminide coatings for the bond coat, which appear to be either simple or modified with "other metallic coatings", such as MCrAlY (col. 1, line 28), said diffusion aluminide being taught by Schaeffer to further include reactive elements (enabling the metastable phases) and a metal such as Pt, Rh, or Pd (col. 1, lines 25-35).

Schaeffer teaches YSZ as the TBC, as required by claim 11 (col. 4, line 30).

It is Examiner's position that the composition and weight percents of the elements of the NiAl beta phase alloy of Schaeffer would have been readily selected by an ordinary

artisan in the field to consist of, inherently, Ni and Al, with alloying amounts of zirconium, as required by claims 15-18.

Limitations of claim 19 have been addressed above.

Draghi (col. 1, line 18) in view of Schaeffer teaches repair of turbine blades, vanes and foils as required by claims 22-24.

Because Schaeffer teaches the same beta phase NiAl alloy and YSZ TBC, it is Examiner's position that the densities are the same, as required by claims 20-21.

Regarding the limitations of claim 25, not discussed above, Draghi (col. 2, line 14) and Arnold (abstract) both teach inspection of the component in order to aid in restoring dimensions. Draghi (col. 2, lines 45-55) and Schaeffer (col. 5, line 38) both teach stripping of the TBC system to remove it for repair.

5. Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Draghi in view of Arnold and Schaeffer as applied to claims 1-6 and 9-25 above, and further in view of Jackson (6,575,702).

Draghi, Arnold, and Schaeffer teach that which is disclosed above, but fail to specifically teach that the nickel-based superalloy is single crystal or directionally solidified.

Jackson teaches that nickel-based superalloys for use in turbine engine components may be made of single crystal-type or directionally solidified-type material.
Since Draghi, Arnold, and Schaeffer teaches a nickel-based superalloy and Jackson teaches the specifics of such an alloy, Jackson would have reasonably suggested one or the other type for use in the method of Draghi, Arnold, and Schaeffer with the expectation of successful results in similar operations.

Response to Arguments

6. Applicant's arguments filed 10/12/2004 have been fully considered but they are not persuasive.

The applicant has argued against the Draghi reference stating that it teaches away from the method of the present application. Applicant argues that Draghi teaches, "sufficient bond coat remains". While Draghi's method does not teach of remove the entirety of the metallic bond layer, they teach, in the admitted state of the art at the time of their invention, of a known and conventional method for turbine repair (Background of the Art). This disclosed method includes "although the stripping process effectively removes the ceramic and metallic portions of the coating, it also removes a portion of the bas metal under the metallic portion" (Column 1, lines 57-60).

The applicant argues that Draghi does not conduct any measurements or perform calculations to rebuild and restore overall dimensions to increase subsequent engine operation efficiency. The examiner respectfully disagrees. Draghi teaches that it is desirable to "repair thermal barrier coated parts periodically to restore them to

desirable conditions" (Column 1, lines 44-46). Restoring the coated parts to desirable conditions inherently teaches of restoring the component to its original state, ie dimensions, thereby increasing the operation efficiency. Draghi does not explicitly teach of performing calculations to determine the amount of coating to apply, however, such calculations are inherent as discussed in the USC 103(a) rejection above.

The applicant argues that Draghi does not restore the coated dimensions of the component and they only teach of an application of a flash coating to increase the number of times a part can be repaired. The examiner respectfully disagrees. Draghi teaches, by way of the admitted state of the art at the time of their invention, that it is desirable to "repair thermal barrier coated parts periodically to restore them to desirable conditions" (Column 1, lines 44-46). Draghi teaches of the "reapplication of the both layers of the thermal barrier coating" (column 2, lines 13-15), where the thermal barrier coating consists of a metallic layer and ceramic layer.

The applicant argues against the Arnold reference, stating that it does not teach of the suggested calculation sequence and the particular coating and removal steps. Arnold is utilized only as a second teaching and the examiner does not rely on Arnold as a teaching of the claimed method. Arnold teaches that during repair of turbine engine foils dimensions are readily measured to determine the amount of build-up thickness to use, which requires the same "$t+\Delta t-\Delta x$" analysis as discussed above in the 35 USC 103(a) rejection.

7. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by

combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Schaeffer is concerned with the repair of thermal insulating ceramic layers and Arnold is discusses a method of manufacturing and repairing turbine airfoils.

8. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Turocy whose telephone number is (571) 272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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